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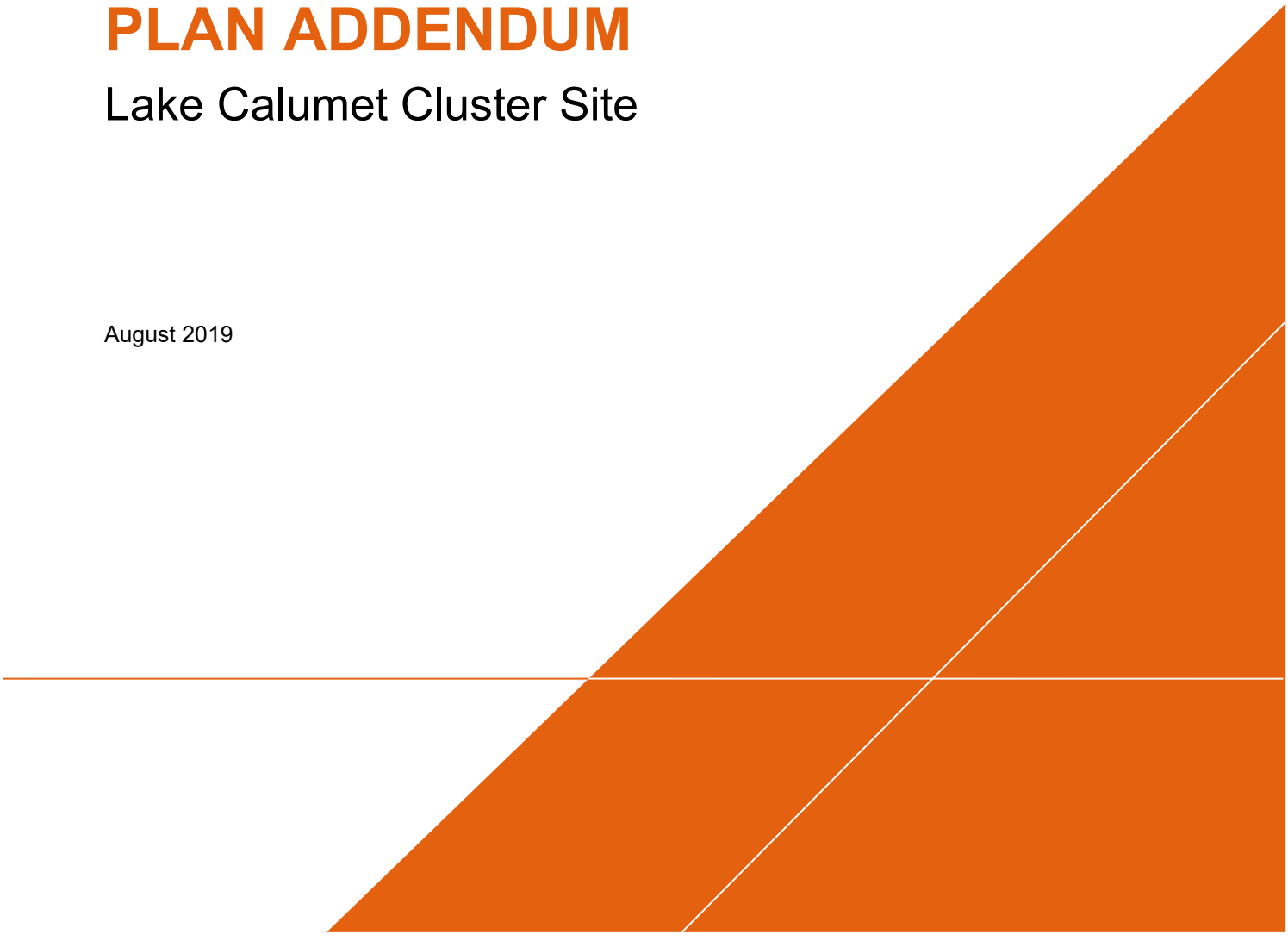
ARCADIS Design & Consultancy for natural and built assets

Lake Calumet Cluster Site Group

QUALITY ASSURANCE PROJECT PLAN ADDENDUM

Lake Calumet Cluster Site

August 2019



Introduction

This Quality Assurance Project Plan (QAPP) Addendum presents updated worksheets and standard operating procedures (SOPs) related to sampling surface water at Indian Ridge Marsh. The procedures to be used in sampling the surface water are outlined in the Surface Water Sampling Plan (Arcadis 2019).

The surface water samples will be submitted to TestAmerica Laboratories, Inc. of University Park, Illinois for analysis of ammonia, metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). The laboratory SOPs for those methods were included in the original QAPP (L-1, L-2, and L-4). Worksheets 17, 18, 20, 21, and 30 have been updated to include the new sampling rationale, sampling method, and analytical steps.

Quality Assurance Project Plan Worksheet #17 – Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

Piezometer Installation

Piezometers will be used to determine the direction of groundwater flow at the site. They will be installed as follows:

- Five shallow downgradient piezometers along the eastern edge of the Site to increase resolution along the Site boundary with Indian Ridge Marsh;
- Four shallow upgradient piezometers along the western property boundary;
- Six deep piezometers (clustered with shallow piezometers) to provide information on vertical gradients and deeper hydrostratigraphic units; and
- Five piezometers in the west central portion of the Site.

HPT and VAP

Eleven HPT locations are proposed on the eastern boundary of the LCCS to fully characterize the site's interaction with the Indian Ridge Marsh. The other boundaries each have four or five locations as needed. The interior of the site has 4 HPT locations. The investigation is meant to be adaptive and responsive to data as it is collected. If data indicates more points are needed they will be added.

Groundwater Sampling

New groundwater wells will be installed in locations determined during the Phase 2 work. It is estimated that eight to twelve well pairs or clusters will be needed. The locations will be chosen as follows:

- Two to three wells will be installed at each location to allow for evaluation of vertical stratification of the aquifer and vertical hydraulic gradients;
- Wells will be screened in specific identified mass-bearing hydrostratigraphic units (HSUs), with screen lengths customized based on the thickness of the HSU to avoid potential communication between HSUs;
- Well clusters will be distributed laterally to provide reproducible monitoring locations that are adequate for evaluating the horizontal hydraulic gradient and groundwater flow direction; and
- A subset of the well clusters will be located along the upgradient portion of the Site to evaluate potential constituent contributions from off-site sources.

Light Non-Aqueous Phase Liquid (LNAPL) Sampling

A sample of the LNAPL in MW-12 will be collected to determine concentrations of VOCs, SVOCs and PCBs in the LNAPL.

Surface Water Sampling

20 locations have been selected for surface water sampling. The locations were selected based on historical surface water data, as well as groundwater data collected from the monitoring wells. The locations are shown in the Surface Water Sampling Plan and include 10 reference locations and 10 near-site locations.

Quality Assurance Project Plan Worksheet #18 – Sampling Locations and Methods/Standard Operating Procedure Requirements

Sampling Location/ ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples (plus field duplicates)[1]	Sampling Standard Operating Procedure (SOP) Reference Number[2]	Rationale for Sampling Location
VAP points. See Figure 2 in the FSP	Groundwater	Adaptive[3]	VOCs, ammonia and dissolved metals	Low	Adaptive[3]	F-4	Additional data to improve the existing understanding of Site impacts and to support future selection and design of an appropriate remedial alternative.
Monitoring Wells	Groundwater	Adaptive[3]	Total compound list	Low	Adaptive[3]	F-6	Locations will be chosen in areas where further information is required to fully characterize the site.
MW-12	Oil/Light Non-Aqueous Phase Liquid (LNAPL)	One grab sample	VOCs, SVOCs, PCBs	High	1	F-7	Characterize LNAPL in well
Surface Water Sampling Points	Surface Water	20 grab samples	VOCs, SVOCs, ammonia, metals	Low	22	F-8	Historical surface water data and Site groundwater data

Notes:

[1] One blind duplicate sample will be collected for every 10 samples.

[2] Sampling SOP reference number from QAPP Worksheet #21.

[3] The depth intervals and number of groundwater samples collected and analyzed from each VAP point will be determined in the field based on the number of permeable water-bearing zones identified during the HPT investigation. An estimated 5 samples will be collected at each location, but additional samples may be added, and sample depths adjusted, to characterize permeable zones. The number of monitoring wells (and thus the number of groundwater samples collected from monitoring wells) will be determined based on the results of the HPT and VAP investigations. Proposed monitoring well locations and construction details will be submitted to the USEPA for review prior to mobilizing for monitoring well installation.

Quality Assurance Project Plan Worksheet #20 -
Sample Quantities and Control Frequencies

Matrix/Analysis	Analytical and Preparation SOP[1]	Estimated Environ. Sample Quantity[2]	Field QC Analyses				Laboratory QC Sample						Total
			Trip Blank		Field Duplicate		Matrix Spike		Matrix Spike Duplicate		Lab Duplicate		
			Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Groundwater													
VOCs (SW-846 8260B)	L-1	24	1/cooler	2	1/10	3	1/20	2	1/20	2	NA	--	33
Metals/ammonia	L-2 through L-5	24	1/cooler	2	1/10	3	1/20	2	1/20	2	NA	--	33
All groundwater analyses	L-1 through L-12	adaptive	1/cooler		1/10		0		1/20		NA		TBD
Light Non-Aqueous Phase Liquid (LNAPL)													
VOCs (SW-846 8260B)	L-1	1	1/cooler	1	0	0	0	0	0	0	0	0	1
SVOCs	L-2	1	1/cooler	1	0	0	0	0	0	0	0	0	1
PCBs	L4	1	1/cooler	1	0	0	0	0	0	0	0	0	1
Surface Water													
All surface water analyses	L-1 through L-12	20	1/cooler	2	1/10	2	0	0	1/20	1	NA	0	25

Abbreviations:
Freq. = frequency
NA = not applicable
QC = quality control
VOC=volatile organic compound

Notes:
[1]See Worksheet #23 for SOP title, revision number and date details.
[2]Sample quantities are approximate

Quality Assurance Project Plan Worksheet #21 – Field Sampling Standard Operating Procedure References

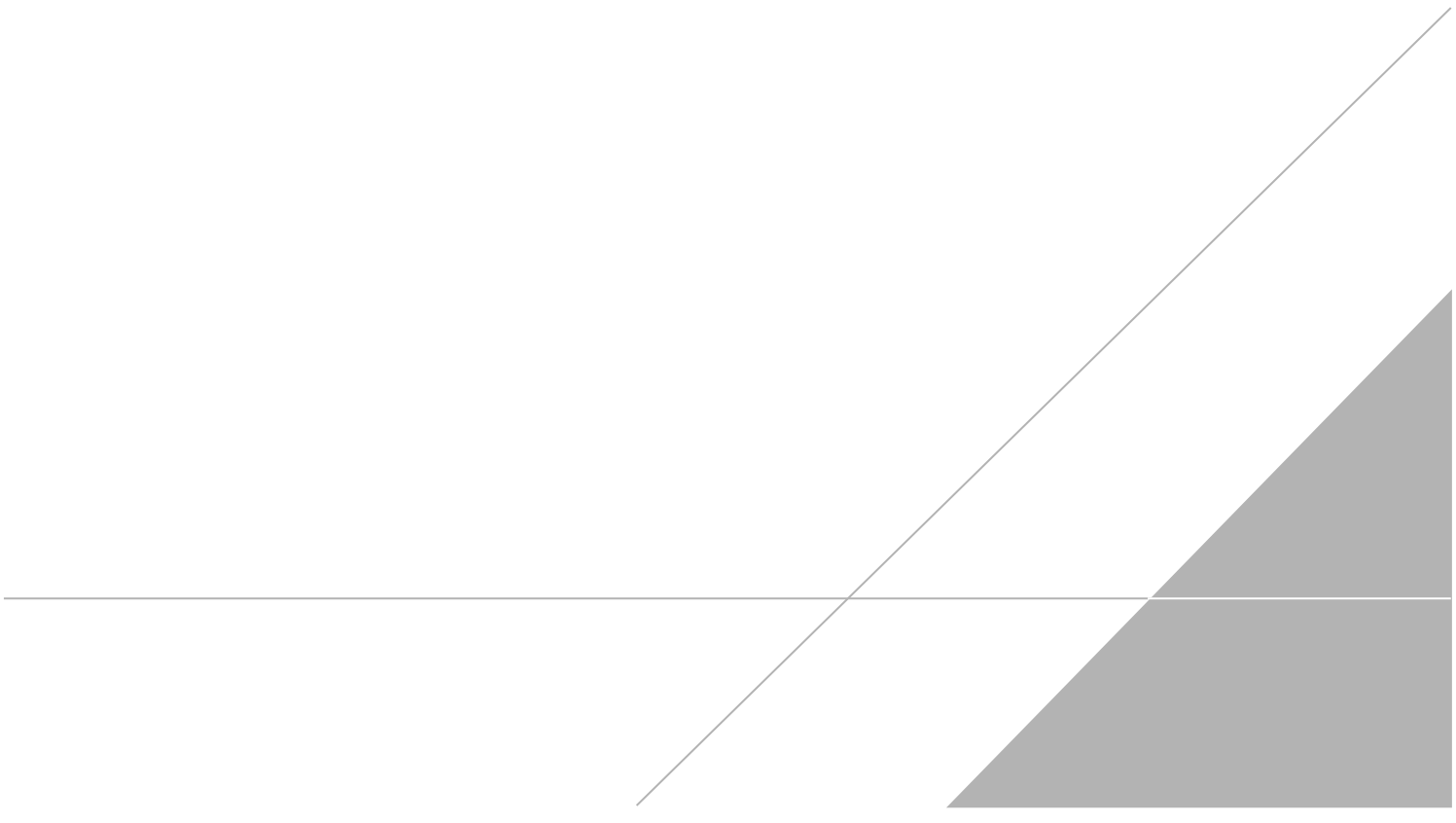
Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Yes/No)	Comments
F-1	Chain-of-Custody, Handling, Packing and Shipping, Rev. #2, Rev Date: March 6, 2009	ARCADIS	See SOP for specific equipment needs	No	Describes field sample custody, handling, packaging and shipping procedures
F-2	Field Equipment Decontamination, Rev. #3, Rev Date: April 26, 2010	ARCADIS	See SOP for specific equipment needs	No	Describes the procedure for field equipment cleaning and decontamination
F-3	Water Level Measurement, Rev. #2, Rev Date: February 24, 2011	ARCADIS	See SOP for specific equipment needs	No	Describes the procedure for measuring groundwater and surface-water elevations, and the required equipment
F-4	Procedures for Use of the Geoprobe Hydraulic Profiling Tool® (HPT), Rev #0 Date: February 2014	ARCADIS	See SOP for specific equipment needs	No	Describes the procedure for HPT and VAP
F-5	Monitoring Well Installation, Rev #3 Date: February 2, 2011	ARCADIS	See SOP for specific equipment needs	No	Describes procedure for installing new monitoring wells
F-6	Low Flow Groundwater Purging and Sampling for Monitoring Wells, Rev #4, Date: February 2, 2011	ARCADIS	See SOP for specific equipment needs	No	Describes procedure for groundwater monitoring
F-7	Standard Groundwater Sampling for Monitoring Wells, Rev #1, Date: July 16, 2008	Arcadis	See SOP for specific equipment needs; follow procedures for bailer sampling	No	Describes procedures for sampling using a bailer
F-8	Surface Water Sampling Standard Operating Procedures	Arcadis	See SOP for specific equipment needs	No	Describes procedure for collecting grab surface water samples

Note: The Field Sampling SOPs are in Attachment 1 of the FSP.

Quality Assurance Project Plan Worksheet #30 – Analytical Services

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time (calendar days)	Laboratory/Organization (name and address, contact person and telephone number)	Backup Laboratory/Organization (name and address, contact person and telephone number)
Groundwater and Surface Water	VOCs, ammonia, dissolved metals	All	See Worksheet #23	21 days for Level 2 Data Package	TestAmerica 2417 Bond Street University Park, IL 60484 708-534-5200	NA

Lake Calumet Cluster Site
Field Procedure



Surface Water Sampling
Standard Operating Procedure

Rev. #: 1

Date: October 23, 2015

Approval Signatures

Prepared by: _____ Date: October 23, 2015
Jesse Starr

Reviewed by: _____ Date: October 23, 2015
Shannon Dunn
(Technical Expert)

I. Scope and Application

This Standard Operating Procedure (SOP) describes the collection of surface water samples using a grab method, discrete depth sampler or peristaltic pump. This SOP should be followed whenever collecting surface water samples. SOP 1510814 Stormwater Sampling describes collecting composite samples.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Manager.

II. Personnel Qualifications

ARCADIS field personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, and site-specific training, as needed. In addition, ARCADIS field personnel will be versed in the relevant SOPs and will possess the skills and experience necessary to successfully complete the desired field work. The project Health and Safety Plan (HASP) and other documents will identify any other training requirements such as site-specific safety training or access control requirements.

III. Equipment List

The following equipment list contains materials that may be needed in carrying out the procedures contained in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- personal protective equipment (PPE) and other safety equipment, as required in the project Health and Safety Plan (HASP)
- project Quality Assurance Project Plan (QAPP)
- Sampling and Analysis Plan (SAP)
- indelible ink pens
- appropriate sample containers, labels, and forms
- decontamination supplies including bucket, distilled or deionized water, cleansers appropriate for removing expected chemicals of concern.
- sample packing and shipping materials

- water-quality (temperature/pH/specific conductivity/ORP/turbidity/dissolved oxygen) meter and flow-through measurement cell. Several brands may be used, including:
  - YSI 6-Series Multi-Parameter Instrument
  - Hydrolab Series 3 or Series 4a Multiprobe and Display
  - Horiba U-10 or U-22 Water Quality Monitoring System
- for grab sampling method: pole with polyethylene and/or stainless steel dipper, if applicable
- for discrete depth sampling method: discrete depth samplers (e.g., Kemmerer or Van Dorn samplers)
- for peristaltic pump sampling method: peristaltic pump with appropriate power source, Teflon® tubing or Teflon®-lined polyethylene tubing of an appropriate size for the pump being used. For peristaltic pumps, dedicated Tygon® tubing (or other type as specified by the manufacturer) will also be used through the pump apparatus.

IV. Cautions

If heavy precipitation occurs and no cover over the sampling area can be erected, sampling must be discontinued until adequate cover is provided. Rain water could contaminate surface water samples.

Do not use permanent marker or felt-tip pens for labels on sample container or sample coolers – use indelible ink. The permanent markers could introduce volatile constituents into the samples.

It may be necessary to field-filter some parameters (e.g., metals) prior to collection, depending on preservation, analytical method, and project quality objectives.

Store and/or stage empty and full sample containers and coolers out of direct sunlight.

Be careful not to over-tighten lids with Teflon liners or septa (e.g., 40 mL vials). Over tightening can cause the glass to shatter or impair the integrity of the Teflon seal.

Use caution and appropriate cut resistant gloves when tightening lids to 40 mL vials. These vials can break while tightening and can lacerate hand. Amber vials (thinner glass) are more prone to breakage.

The ability to safely access the surface water sampling locations should be verified prior to sampling.

Field activities will be performed in accordance with a project-specific HASP, a copy of which will be present onsite during such activities.

Safety hazards associated with sampling surface water include fast-moving water, deep water, and steep slopes close to sampling sites. Extreme caution should be used when approaching sampling sites. Work will be performed in accordance with the project-specific HASP.

V. Procedure

Sampling Method

Surface water samples will be collected from sampling locations sequentially from downstream to upstream to prevent cross-contamination associated with sediment disturbance. Surface water samples will be collected prior to sediment sample collection.

Grab Sample Collection

Personnel conducting surface water sampling using grab sample collection techniques should perform the following:

1. Collect appropriate equipment, cleaned and decontaminated.

2. Obtain appropriate sampling containers.

3. Mobilize to surface water sampling location in accordance with the work plan or SAP.

4. Collect sample by directly lowering the laboratory-supplied sample container into the water and allowing the bottle to partially fill with water. The sampler will hold the bottle immediately below the water surface and allows the bottle to fill with sample. Field personnel will handle only the portions of the sample containers that do not come in contact with the sample, to avoid contamination. Additionally, care will be taken to avoid exposing samples and sample containers to atmospheric inputs such as dirt or dust.

5. Measure water quality parameters.

6. Transfer surface water samples into laboratory-supplied sample containers to complete the scope described in the SAP. Avoid overfilling sample containers to prevent preservatives, if present, in sample container from being lost.

Sample Collection Using a Discrete Depth Sampler (e.g., Kemmerer or Van Dorn)

Personnel conducting surface water sampling using grab sample collection techniques should perform the following:

1. Collect appropriate equipment, cleaned and decontaminated.

2. Obtain appropriate sampling containers.

3. Mobilize to surface water sampling location in accordance with the work plan or SAP.

4. Carefully set the sampling device so that water is allowed to pass through the tube.

5. Lower the pre-set sampling device to the predetermined depth using marked rope or line attached to the device.

6. When at desired depth; send down the messenger, closing the device. Avoid disturbing the bottom.

7. Retrieve sampler and discharge the first 10-20 mL to clear any potential cross-contamination.

8. Measure water quality parameters

9. Transfer surface water samples into laboratory-supplied sample containers to complete the scope described in the SAP. Avoid overfilling sample containers to prevent preservatives, if present, in sample container from being lost.

10. Pack and store samples appropriately for transport to laboratory.

Sample Collection Using Peristaltic Pump

Personnel conducting surface water sampling using peristaltic pump collection techniques should perform the following:

1. Surface water will be collected using a peristaltic pump if flow is slow and conventional sampling procedures are impossible without collecting excess

suspended sediment in the sample. Note any observations such as color or odors and determine the depth of water. Record the information in the field log book or field log forms.

2. Personnel should be aware that contact with peristaltic pump apparatus (e.g., control knobs) can serve as a source of metals contamination in dissolved metals analyses. Operation of pump controls should be conducted with gloves that do not come into contact with the sample or with materials that contact the sample.

3. Attach tubing to pump and configure tubing such that intake in positioned at the desired sample depth within the water column and discharge is into desired sample container.

4. Turn the pump on and adjust the flow rate as necessary to avoid splashing or overfilling.

5. Measure water quality parameters on a volume of sample that will not be shipped to the laboratory to avoid cross-contamination in the sample to be analyzed.

6. Collect surface water samples by diverting flow out of the unfiltered discharge tubing into the appropriate labeled sample container.

– If a flow-through analytical cell is being used to measure field parameters, the flow-through cell should be disconnected after stabilization of the field indicator parameters and prior to surface water sample collection. Under no circumstances should analytical samples be collected from the discharge of the flow-through cell.

– When the sample container is full, tightly screw on the cap.

– Samples should be collected in the following order: VOCs, TOC, SVOCs, metals and cyanide, and others (or other order as defined in the Sampling and Analysis Plan (SAP)).

7. Pack and store samples appropriately for transport to laboratory.

VI. Waste Management

Liquid investigation-derived wastes (IDWs), such decontamination liquids or excess surface water, will be collected into 55-gallon drums and may be transferred into large-volume polyethylene tanks with secondary containment pending treatment and/or disposal.

Non-aqueous liquid wastes, if generated (e.g., hexane, non-aqueous phase liquid [NAPL]), will be segregated and stored in appropriately sized buckets with secondary containment pending disposal.

PPE, soiled disposable items, and other trash will be stored in 55-gallon drums and stored on site pending disposal.

IDWs will be collected and stored on site in United States Department of Transportation (DOT)-compliant 55-gallon drums and/or large-volume tanks with secondary containment. Fifty-five-gallon drums and tanks will be labeled with DOT-compliant labels with the following information: drum contents, generator contact information, and date container was filled. IDWs known to be hazardous will be segregated and stored separately from non-hazardous IDWs. Solid IDWs will be segregated and stored separately from liquid IDWs.

IDWs will be sampled as needed for disposal characterization and stored on site pending treatment and/or disposal. IDWs may be managed in conjunction with remedial activities.

All IDWs will be stored in a secure onsite location pending treatment and disposal and/or discharge.

VII. Data Recording and Management

Record field data in field notebook and/or on field log sheets.

VIII. Quality Assurance

Sample quality will be achieved by complying with the procedures outlined in this SOP. Cross-contamination will be prevented by following standard decontamination protocols. Field activities will be supervised by appropriate experienced field supervisors. Additional quality assurance information is presented in the project-specific Quality Assurance Project Plan.